

# Soil Lead Contamination in the Westside of Atlanta

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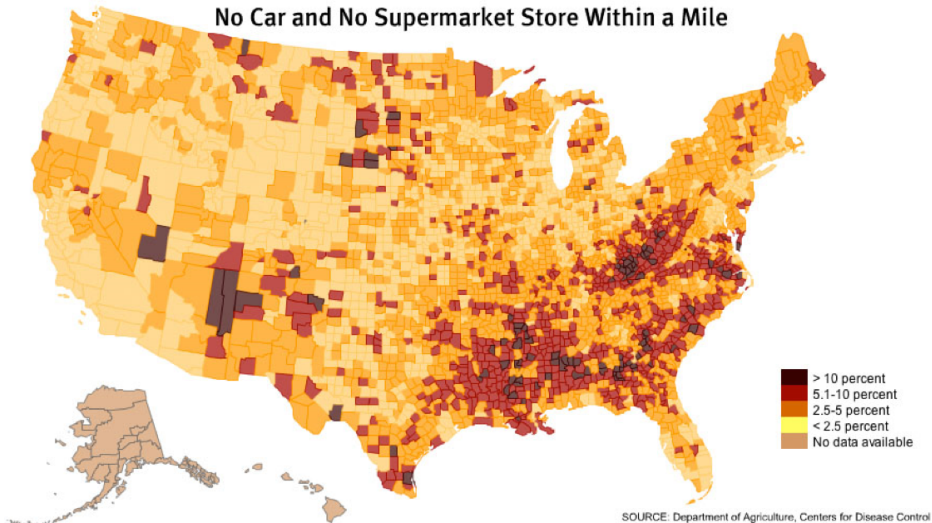
Eri Saikawa

October 6, 2021

Department of Environmental Sciences, Emory University

# Food Desert in the US

No Car and No Supermarket Store Within a Mile

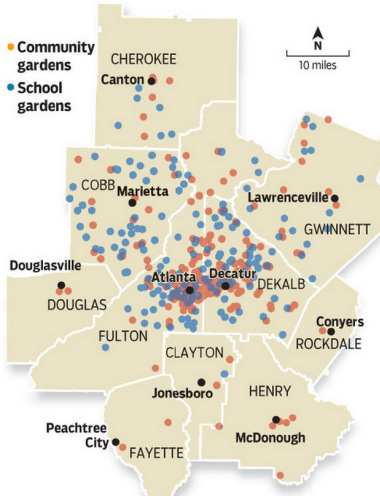


SOURCE: Department of Agriculture, Centers for Disease Control

# Community Gardens in Atlanta

## Community gardens

Today there are more than 300 community and urban gardens across metro Atlanta, and more are on the way.



Source: Atlanta Regional Commission

ROBERT CALZADA / STAFF

# Urban Agriculture AgLanta



AGLANTA AGLANTA CONFERENCE RESOURCES "GROWS-A-LOT" PROGRAM URBAN FOOD FOREST AT BROWNS MILL AGLANTA EATS

Welcome to **AgLanta**, your digital food hub for all things urban agriculture from the **Mayor's Office of Resilience, City of Atlanta**. The Atlanta community has voiced the need to strengthen the local food system. Food is now a part of the **Resilient Atlanta Strategy** (sections 3.3.1 and 3.3.2), as well as other city-sponsored policies, projects, and programs.

**AgLanta.org** serves as a portal to learn, share, and celebrate ways we can **collectively** cultivate a resilient, equitable, and accessible food system in Atlanta by 2025. Keep going and growing! **#AgLanta**





## SOIL CONTAMINANTS



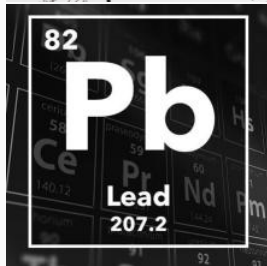
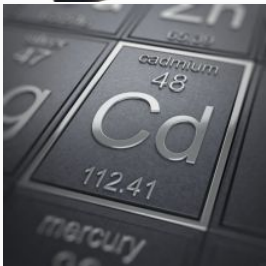
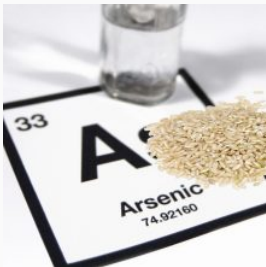
**Heavy metals**  
**Mineral pollutants**  
**Organic compounds**  
**Inorganic ions and salts**

**Phenolic Compounds**  
**PCBs and Dioxins**  
**Herbicides**  
**Pesticides**

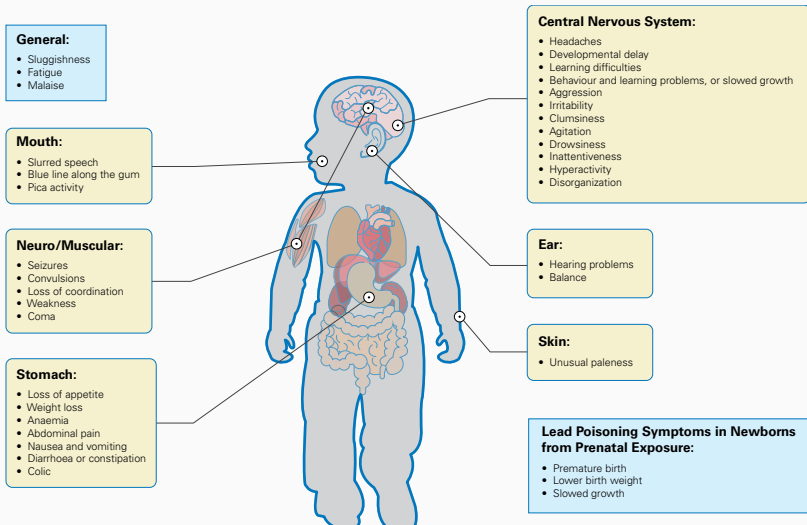
The master list of contaminants to be screened  
for can be found on the EPA's website.



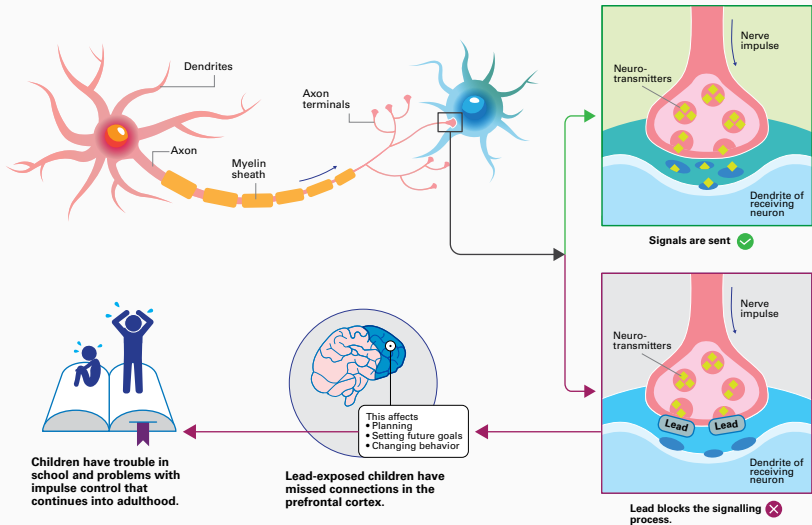
# Heavy Metals and Metalloids (HMM)



# Health Impacts of Lead Exposure

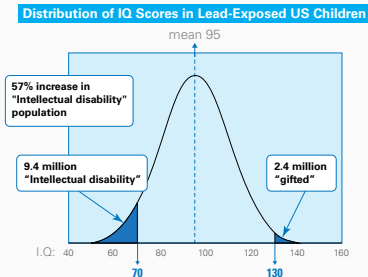
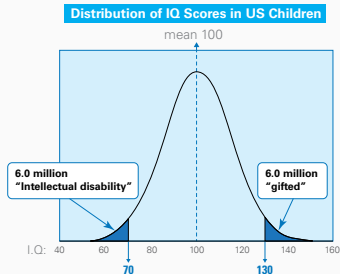


# How lead affects IQ scores





Source: Mary Gearing and Krissy Lyon, SITNBoston, Harvard University Graduate School of Arts and Sciences. See: <http://sitn.hms.harvard.edu/flash/2016/deadly-biology-lead-exposure/>

# Distribution of IQ scores due to lead exposure in US



Source: The WHO and the Lead Paint Alliance<sup>64</sup>, originally Weiss B. Neurobehavioral toxicity as a basis for risk assessment. Trends Pharmacol Sci. 1988;9(2):59-62. doi:10.1016/0165-6147(88)90118-6.

# Blood lead levels

Blood Lead Levels in $\mu\text{g/dL}$ (micrograms per deciliter)		Effects
 <b>Children &amp; Adults</b>		
	<b>&lt;5 <math>\mu\text{g/dL}</math></b>	Decreased IQ, cognitive performance and academic achievement; increased incidence of problem behaviours and diagnosis of attention deficit/hyperactivity disorder; reduced fetal growth (based on maternal blood concentration); impaired renal function; reduced synthesis of aminolevulinic acid dehydratase (ALAD), contributing to anaemia
	<b>&lt;10 <math>\mu\text{g/dL}</math></b>	Delayed puberty; developmental toxicity
	<b>&lt;20 <math>\mu\text{g/dL}</math></b>	Increased level of erythrocyte protoporphyrin; decreased vitamin D metabolism; decreased calcium homeostasis
	<b>&gt;20 <math>\mu\text{g/dL}</math></b>	Anaemia
	<b>&gt;30 <math>\mu\text{g/dL}</math></b>	Reduced nerve conduction velocity; increased vitamin D metabolism; increased risk of hypertension in adulthood
	<b>&gt;40 <math>\mu\text{g/dL}</math></b>	Decreased haemoglobin synthesis
	<b>&gt; 50 <math>\mu\text{g/dL}</math></b>	Severe neurological feature
	<b>&gt; 60 <math>\mu\text{g/dL}</math></b>	Abdominal colic; features of acute poisoning but no encephalopathy
	<b>&gt; 90 <math>\mu\text{g/dL}</math></b>	Encephalopathy
	<b>&gt; 105 <math>\mu\text{g/dL}</math></b>	Severe neurological features
	<b>150 <math>\mu\text{g/dL}</math></b>	Death
 <b>Adults</b>		
	<b>&lt;5 <math>\mu\text{g/dL}</math></b>	Impaired renal function; reduced synthesis of delta-aminolevulinic acid dehydratase, contributing to anaemia
	<b>&lt;10 <math>\mu\text{g/dL}</math></b>	Hypertension, increased cardiovascular-related mortality, spontaneous abortion, preterm birth
	<b>&gt; 40 <math>\mu\text{g/dL}</math></b>	Peripheral neuropathy, neurobehavioural effects, abdominal colic
	<b>&gt; 50 <math>\mu\text{g/dL}</math></b>	Decreased haemoglobin synthesis

# The source of lead exposure?

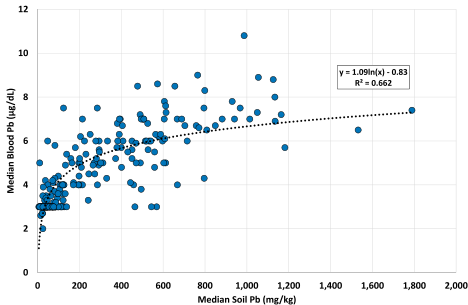
1. Some traditional cosmetics
2. Lead-based paints and pigments
3. Some toys and jewellery
4. Certain herbal, traditional and ayurvedic medicines
5. Dust and chips from peeling, cracking lead-based paint
6. Certain spices and candies
7. Some solders in food cans
8. Lead-based ceramic glazes on dishes and cooking pots
9. Some metallic cookware
10. Leaded gasoline
11. Lead water pipes and fixtures
12. Contaminated industrial sites
13. Unsound ULAB recycling sites
14. Emissions from waste incinerators
15. Contaminated soil where children play and food is grown
16. Family members with occupational exposure who bring lead dust home on clothes and shoes



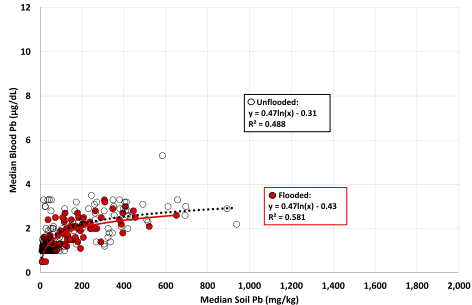
# Soil Lead Levels and Blood Lead Levels

Median topsoil Pb in communities in New Orleans decreased 44% while children's Blood Pb levels declined 64% over 15 years

● Blood Pb 2000-2005 vs. Soil Pb 1998-2001



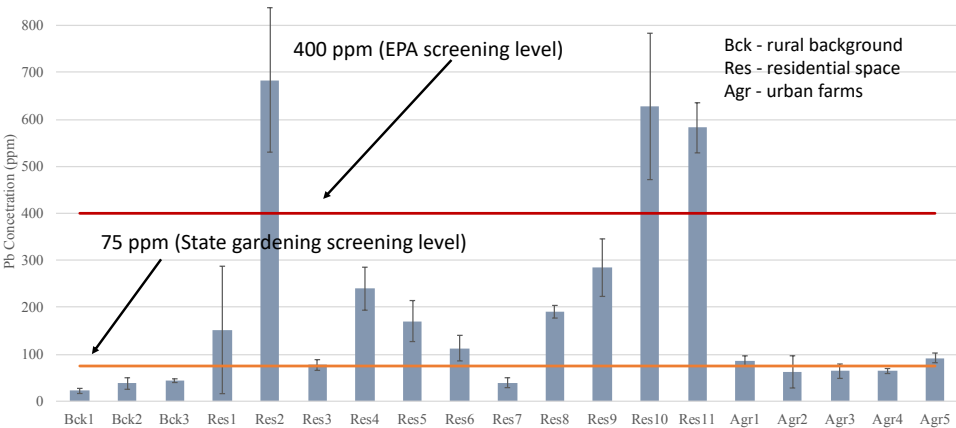
Blood Pb 2011-2016 vs. Soil Pb 2013-2017



Mielke et al., 2019

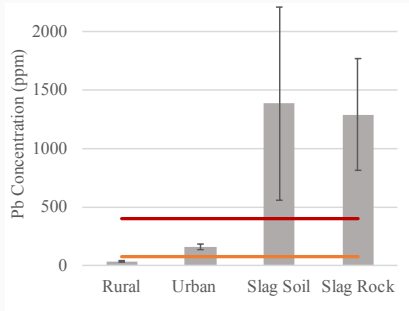


# Lead levels in Atlanta soils



Peters et al., in prep.

# Slag found in the neighborhood



Slag: waste matter separated from metals during smelting or ore refining



# EPA site investigation

[Environmental Topics](#)[Laws & Regulations](#)[About EPA](#)[Contact Us](#)

## Superfund Site:

[Superfund Home](#)[This Site's Home Page](#)[Site Contacts](#)[Cleanup Activities](#)[Health & Environment](#)[Stay Updated, Get Involved](#)[Site Documents & Data](#)[View Site on Map](#)

## WESTSIDE LEAD ATLANTA, GA

### Announcements and Key Topics

In consultation with the Georgia Environmental Protection Division (GEPD), the U.S. Environmental Protection Agency proposed the Westside Lead Site in Atlanta, Georgia, to the Superfund program's National Priorities List (NPL). The NPL is a priority list of hazardous waste sites eligible for cleanup funds. EPA is soliciting public comments on the proposed listing for 60 days ending on November 8, ...

[Continue reading announcements and key topics »](#)

### Background

In 2018, an Emory University doctoral student shared data with the EPA showing elevated lead levels collected from soil samples in Atlanta's Westside. Additional research by the EPA led to ...

[Continue reading background »](#)

### Site Contacts

#### Community Involvement Coordinator

[Ron Tolliver](#)

(404) 562-9591

#### Remedial Project Manager

[Leigh Lattimore](#)

(404) 562-8768

[View all site contacts »](#)

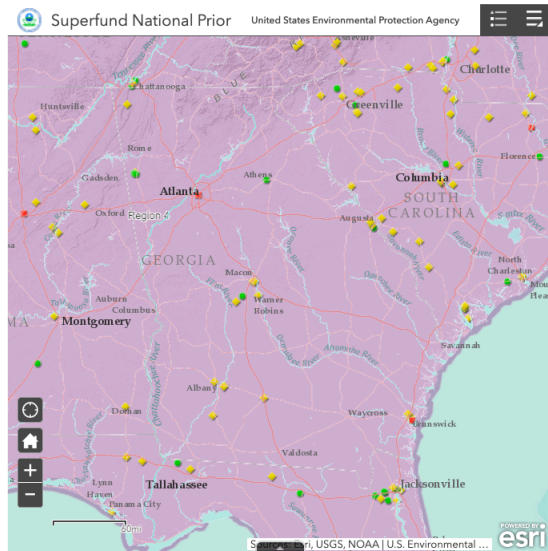
### Site Location

#### Street Address:

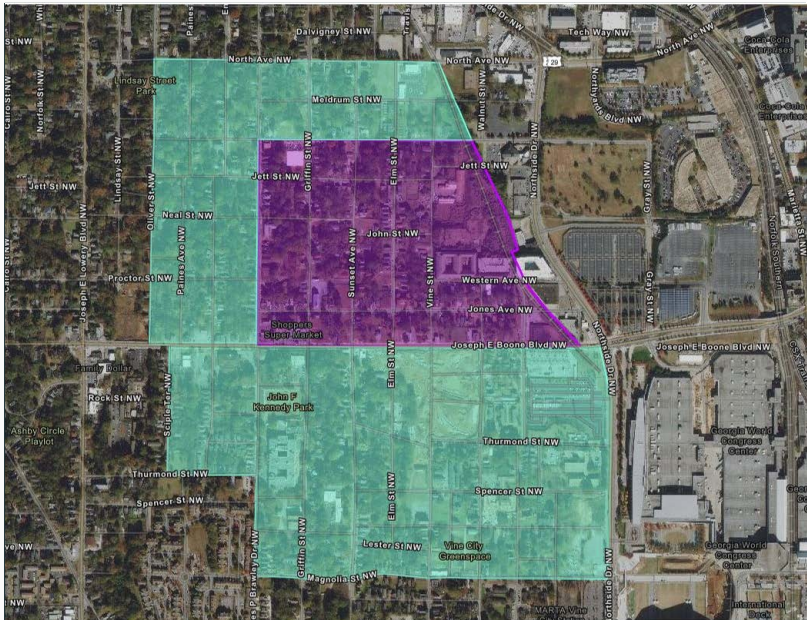
431 VINE STREET NW  
ATLANTA, GA 30318

[Sign up](#) for this Superfund site's mailing list

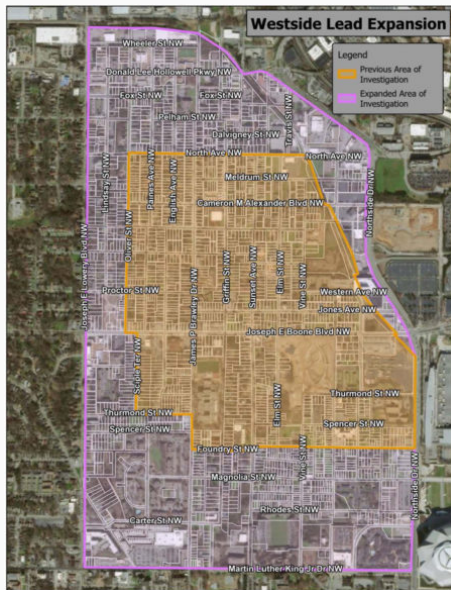
## Superfund National Priorities List (NPL) Where You Live Map



## Investigation area



# Investigation area



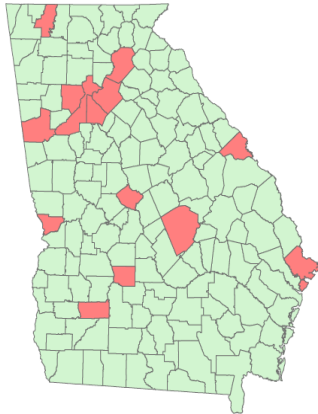
Source: Georgia Health News

# High Lead Poisoning Risk Counties in GA

## Georgia - High Lead Poisoning Risk Counties

*N = 14*

*Based on 2010 Screening Data*

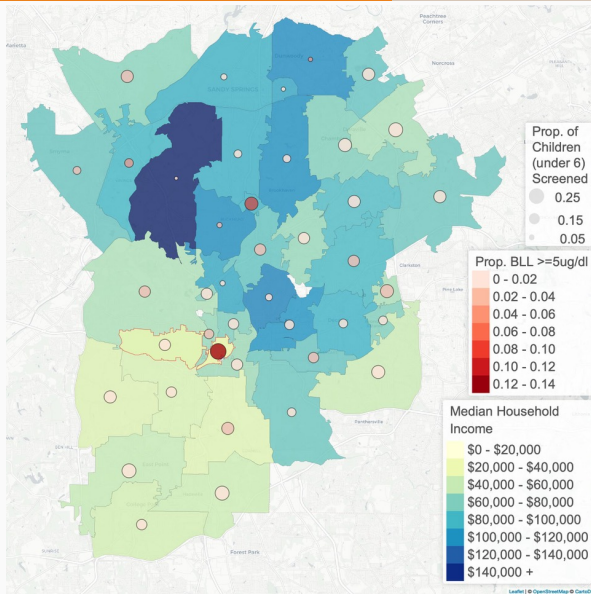


High Risk Counties

Data Sources: GCLPPP and CMO Databases



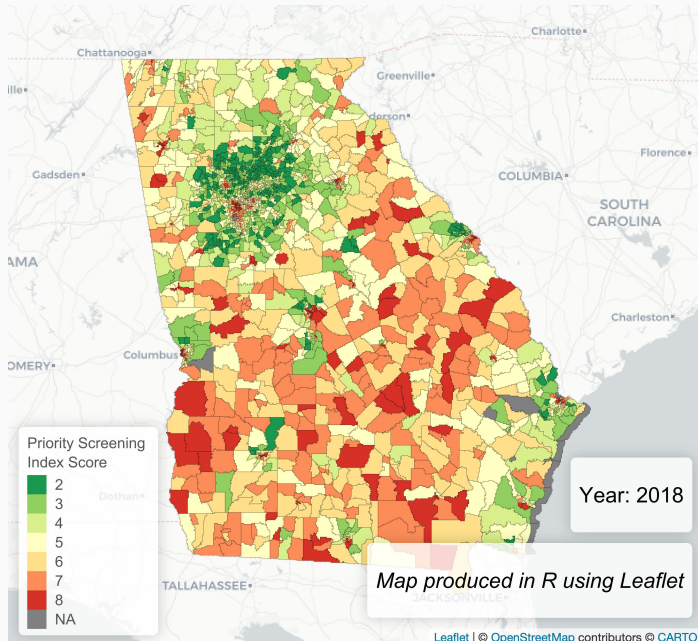
# Lead Exposure in Metro Atlanta



Distler and Saikawa, 2021

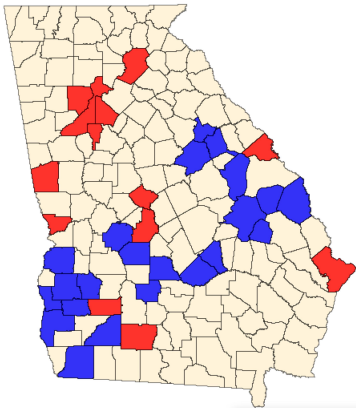


# Where should we target in Georgia?



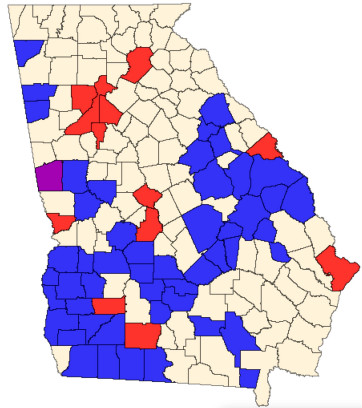
# Where should we target in Georgia?

Maybe we need to target other areas for prevention purposes.



■ Rustin et al. (2015) High Risk Counties  
■ Priority Screening Index Level 8 Counties  
■ Overlapping Counties

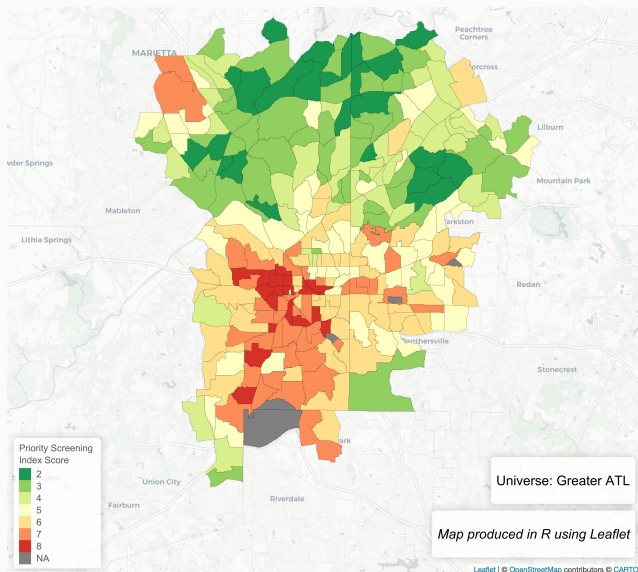
Leaflet



■ Rustin et al. (2015) High Risk Counties  
■ Priority Screening Index Levels 7-8 Counties  
■ Overlapping Counties

Leaflet

# Where to target in Metro Atlanta?



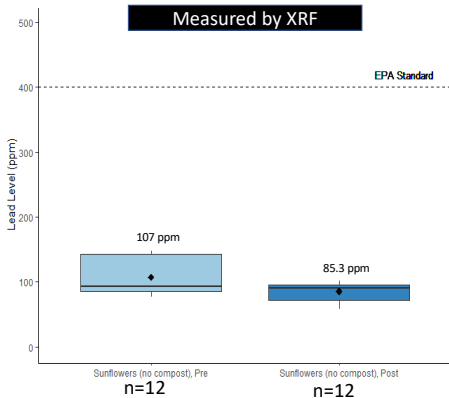
# Phytoremediation experiment in the field



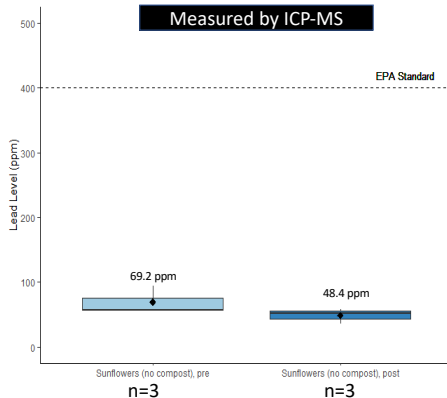
Photo: Alicia Wun

# Phytoremediation/Phytostabilization

## Soil Pb reduction after the experiment



**Decrease of 21.7 ppm ( $p=0.0970$ )**



**Decrease of 20.8 ppm**

Wun et al., in prep

# Phytoremediation/Phytostabilization

## Experiment in the greenhouse



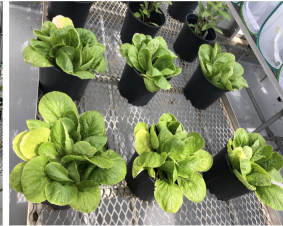
*Helianthus annuus*  
(sunflower)



*Gomphrena globosa*  
(globe amaranth)



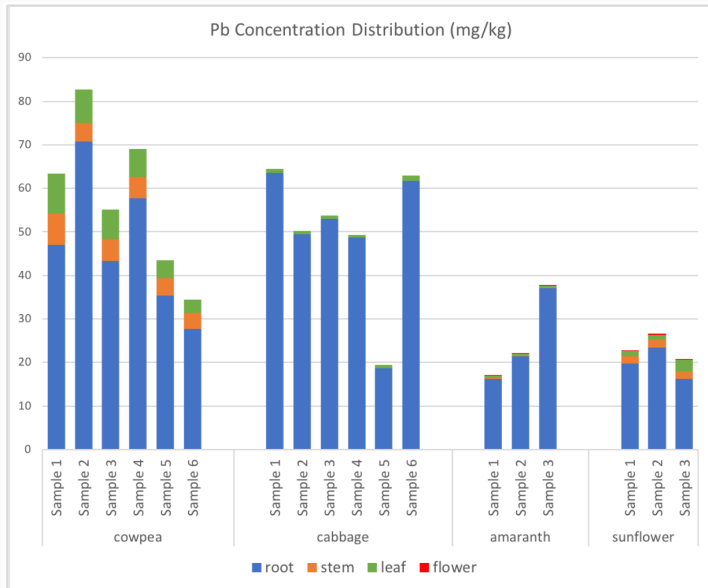
*Vigna unguiculata*  
(cowpea)



*Brassica pekinensis*  
(Chinese cabbage)

Yao et al., in prep

# Soil Pb reduction after the experiment



## Recommendations

- Soil Pb contamination is an issue in the Westside and potentially other areas in Atlanta and beyond.



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- Soil regional screening level for Pb should be more stringent and more comprehensive measures for health risk assessment is needed.
- There is an urgent need for a low-cost remediation option for the community.

# What are we doing now?



Check it  
out here →



PARTICIPATE IN A FREE SOIL LEAD  
SCREENING OPPORTUNITY

## COMMUNITY SCIENCE SOILSHOP

October 15 - November 15

SCAN THE QR CODE TO LEARN HOW TO  
COLLECT YOUR SOIL SAMPLE AND WHERE TO  
DROP OFF YOUR SAMPLES

Visit our website at [www.atlsoilsafety.com](http://www.atlsoilsafety.com)  
for more information or email us at  
[atlsoilsafety@emory.edu](mailto:atlsoilsafety@emory.edu)



## PREPARE YOUR SOIL SAMPLE

5

Mark your sample on your Ziploc bag(s) using a sharpie - write your first name initial, last name, street name, zipcode, and S1 for your first sample and S2 for your second sample

Example: Jane M. Doe living on Clifton Road in the zipcode 30329 would label their bag like this:



1

Select up to two sites where you want to test soil lead in your residential area

2

Watch the instruction video and take six scoops per site in a container

3

Mix the soil in your container and remove all rocks, twigs, and big objects then dry the soil in the sun

4

Move your soil to a ziploc bag

6

Place your ziploc bag(s) into a bigger bag with a piece of paper that has your sample label (same as above) and email address

7

Fill out the online form on our website [atlsoilsafety.com](http://atlsoilsafety.com)

8

Drop off your samples at one of the locations listed on our website

# Saikawa Lab Members



# Acknowledgments

## Saikawa Lab Members (Former & Current)

- Sam Peters, Xinyi Yao, Sam Distler, Alicia Wun
- Lauren Balotin, Sarahna Moyd, Elena Jordanov, Wanyi Yang
- Lalita Martin, Rachel Deininger, Augustine Kang, Kristina Koh
- Minglun Wang, Jessica Yeung, Antoinette Williams



# Acknowledgments

## Collaborators

- Tim Frederick, Gil Frank, Rosario Hernandez
- Sydney Chan, Erik Edwards, Franklin Sanchez
- Taranji Alvarado, Chris Theal, Arthur Hines
- Faith Black, Leann Bing, Candis Hunter

## Funding

- HERCULES (NIH P30ES019776)
- EPA (01D14720, 0000059025)



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